Desktop Virtualization: New Business Opportunities with Cost-Effective, Flexible Desktops As A Service

Introduction

Service providers and enterprises today are working to reach a shared goal: how to better serve global customers. What is a challenge for the enterprise—lowering IT and desktop costs and increasing productivity through access to anytime, anywhere, any device services—is fast becoming a business opportunity for the service provider and a source for new service revenue and higher margins. In fact, service providers, because of their networking, billing, and services expertise, may be uniquely positioned as trusted business partners providing enterprise customers with outsourced, real-time, on-demand managed services.

In many businesses today, every new service has its own silo, and service deployment is slowed as services cross various organizational silos. In order to rapidly provision and offer new services, service providers, much like enterprise businesses, must transform their infrastructures with new data center technologies. These technologies, such as standards-based unified architectures, virtualization, orchestration, and automated provisioning, make cloud utility architectures technically and operationally feasible.

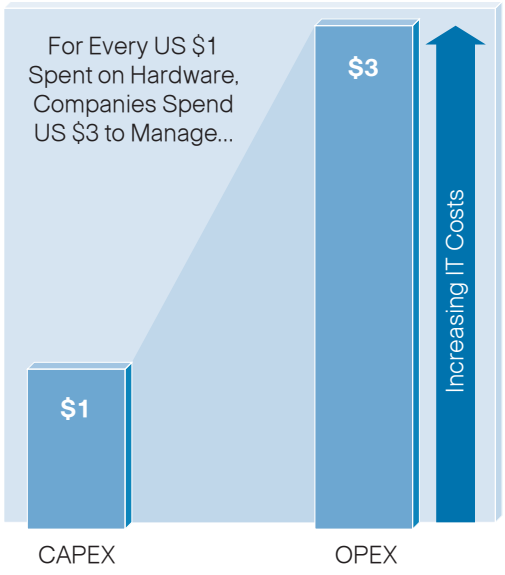
Many service providers, who are already expert at provisioning, managing, and scaling infrastructure-based services for multiple customers, are starting with service offerings based on utility architectures where the enterprise uses a pay-as-you-go infrastructure from the service provider. Such offerings, where enterprise customers run workloads on the provider's infrastructure, have been called "virtual infrastructure hosting" services. The offerings include, for example, computing, business continuity (disaster recovery), and virtual desktop infrastructure (VDI) as a service. By offering the flexibility of capacity and services on demand and at scale with cloud multitenancy capabilities, service providers can amortize their infrastructures across multiple customers, thus reducing costs.

In turn, global desktop users within an enterprise—employees, remote workers and contractors, consultants, partners, and suppliers—require mobility, flexibility, and device-independent, media-rich, and secure collaboration. Users often must manage and synchronize multiple devices, as well as worry about network availability. User requirements place heavy demands on the network for increasing bandwidth and on PC desktop infrastructures, which are proving to be both inflexible and costly to support. In addition to reduced budgets for new desktop hardware and software in house, CIOs and IT managers report that they are dealing with rising IT costs associated with:

- Spending too much time on desktop support calls
- Increased desktop software maintenance and power consumption
- Managing new operating system (OS) and software rollouts, for example, Microsoft Windows 7
- Increasing data protection
- Complying with stringent privacy requirements and new regulations
- Ensuring security and compliance
- Enabling disaster recovery
- Managing a distributed IT environment, including
  - Thousands of applications and a wide variety of devices
  - An increasingly global, geographically dispersed workforce
  - Demand for mobility and collaboration
  - Increased numbers of contractors and other outsourcers
  - Personnel moves, additions, and changes
  - Productivity needs

For every U.S. dollar spent on hardware, companies spend US $3 on managing PCs, according to a 2010 report by IDC (Figure 1). Based on the level of management provided, PC desktop total cost of ownership (TCO) is reported at approximately $5000 per year by industry analysts, with notebook TCO estimated at approximately $5000 and $7000 for day and traveling workers respectively (Gartner 2008).

Figure 1. PC Management Costs



Desktop Virtualization

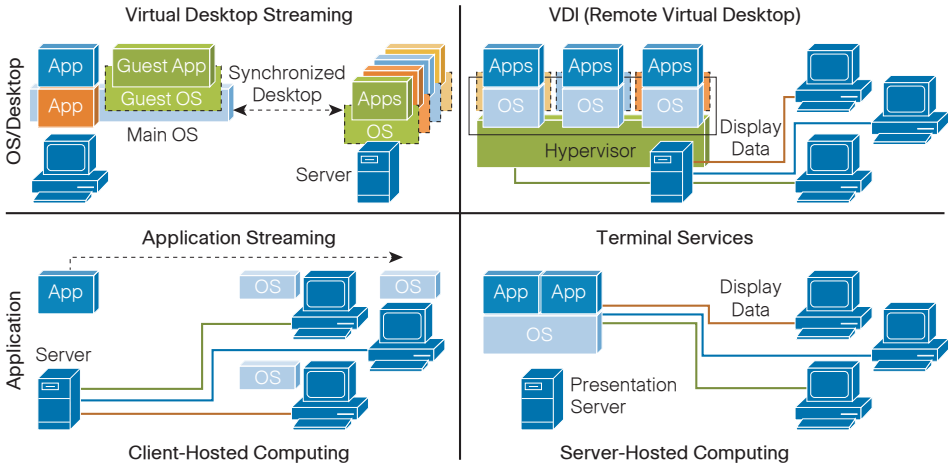
To obtain more cost-effective desktop and service delivery models and meet the needs of enterprise users, businesses are considering a wide variety of approaches, including implementation of desktop virtualization solutions in house, as well as obtaining VDI/desktop as a service in the cloud.

Desktop virtualization includes a suite of possible approaches for virtualizing user access to desktops and applications. The premise of desktop virtualization is to decouple the location of the execution of the application from where the client resides, allowing new client computing paradigms. In the virtual world, application execution may take place on the client (client hosted) or on the server (server hosted). Virtualization may be applied to the operating system, to the application, or to both.

There are several types of desktop virtualization, of which virtual desktop infrastructures (VDI), is one type. VDI, for example, allows users to access virtual desktops in the data center across the network through physical end-point user devices (such as thin clients, PCs, and other devices), thus providing a portable PC desktop experience.

- **Virtual Desktop Streaming:** Virtual desktop streaming is a hybrid approach to virtual desktops in that a guest OS/desktop image is hosted within a client hypervisor on a local device (PC) but is synchronized between the virtual and OS/desktop state in the data center. This solution has the advantage that users have access to data when not connected to a network, while maintaining the ability to control and manage the virtual desktop environment.
- **Application Streaming or Operating System (OS) Streaming:** Elements of the application are downloaded to a remote device and executed locally. The application executable is not persistent and is downloaded each time the application is started from a central server. This type of desktop virtualization does not involve a hypervisor. The desktop devices connect to the network, instead of performing a local hard disk boot. Then each network server mounts a disk image, which is either a virtual machine disk or virtual hard disk, across the network.
- **Virtual Desktop Infrastructures or Remote Virtual Desktops:** VDI is the practice of hosting a desktop operating system within a virtual machine running on a centralized server. VDI is a variation on the client/server computing model, sometimes referred to as server-based computing. A virtual desktop can consist of a user's OS/desktop environment, hosted within the data center and accessed using a thin client from a remote device. The advantage of this solution is that the desktop environment can be managed and backed up in a consistent manner, as well as restored if a user compromises the desktop with a virus.
- **Terminal Services:** With terminal services, the desktop is hosted remotely and accessed through a thin client. The desktop may be hosted on a discrete server within the data center, or on a virtual machine. See Figure 2.

Figure 2. Virtual Desktop Models

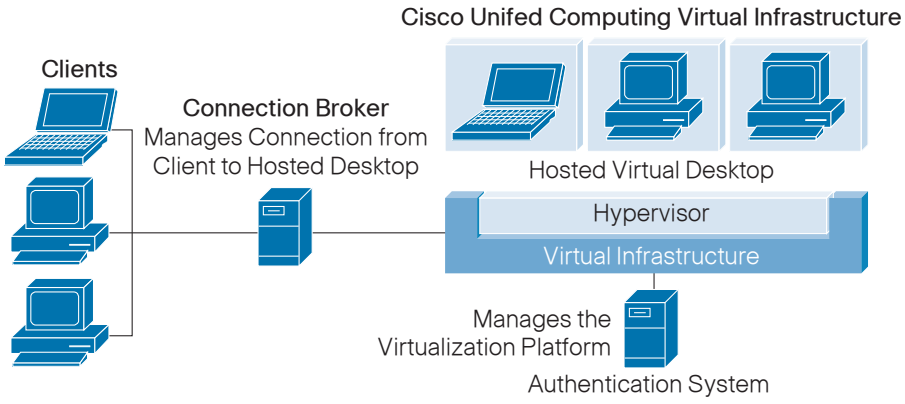


The most commonly deployed form of desktop virtualization today is terminal services represented in the lower right quadrant of Figure 2. There is growing interest in VDI, or remote virtual desktops, described in the upper right quadrant. The client-hosted technologies are generally applied to lower the cost of delivering the application rather than changing where it is run. They may be used independently or in support of the remote technologies. Remotely executed applications typically rely on display protocols such as Microsoft Remote Desktop Protocol (RDP), Citrix Independent Computing Architecture/High-Definition User Experience (ICA/HDX), Teradici PC-over-IP (PCoIP), and many RDP variants to deliver the application.

According to industry leaders and analysts, VDI may be fast becoming the most common architecture for desktop virtualization, as well as the most appropriate model for service providers to offer. Although some 25 percent of enterprises plan to adopt the technology over the next 12 to 24 months, according to estimates, current enterprise VDI deployments are not yet large in scale (Yankee Group 2009).

VDI's hosted virtual desktop environment consists of server platforms, virtualization software to host desktops, connection broker/session management software for connecting users with desktops, and tools for desktop provisioning (Figure 3). VDI estimated annual costs per desktop (client, broker/hypervisor, compute, and storage) are approximately $750 to $1250.

Figure 3. Virtual Desktop Infrastructure



VDI/Desktop as a Service

Today many companies are considering VDI as part of their strategy for delaying hardware refreshes, reducing power consumption, and limiting the deployment of more expensive, fat-client PCs, or as part of their migration strategy around new operating system and software introductions, for example, Microsoft Windows 7. According to *Information Week* Analytics 2009 Virtualization Management Survey however, 47 percent of businesses surveyed cite the initial capital investment to make VDI work in their environment as a barrier to the adoption.

Unlike in house implementations of VDI, VDI/desktop as a service from a service provider can deliver similar benefits but does not require large initial investments.

With VDI/desktop as a service in the cloud, the desktop PC changes from a static and distributed asset to a virtualized and centralized, user-centric tool that is outsourced and made available as a subscription service (Figure 4). By purchasing non-strategic desktop resources as a service, enterprise businesses can:

- Avoid initial infrastructure costs associated with adopting desktop virtualization solutions
- Lower the cost of IT and desktop management by paying for only the desktops used
- Focus on mission-critical applications and technologies
- Reduce spending on hardware and software acquisitions
- Extend the life of current desktops
- Enable affordable scalability and easily accommodate varying service levels and user demand
- Enhance user productivity, mobility, and flexibility
  - Increase productivity with less user downtime and automated desktop and data backup
  - Provide rapid new service deployment
  - Help ensure service availability with tight service level agreements

VDI/desktop as a service also helps protect user data, streamline desktop and service management, improve security and compliance, and enable faster disaster recovery and business continuity. Why? Centralized control. With VDI/ desktop as a service, content creation and retention occur in a highly secure, controlled, and audited data center with flexible user access on demand. Virtual desktops also result in lower power and cooling consumption, thus reducing the environmental impact and costs.

The VDI/desktop as a service solution, because of its portability and availability, also can help better serve diverse, global users, including businesses with branch offices, large campuses, and remote locations, as well as growing numbers of mobile and independent workers.

From an IT standpoint, VDI/desktop as a service is a flexible solution. Desktop images can range from generic, small, highly secure kiosk-style images to fully customizable PC desktops. From the user's perspective, VDI/desktop as a service can be customized for each user, including settings and preferences.

In addition, VDI is operating system- and device-agnostic; that is, it works with a wide variety of user devices and their operating systems, including iPads and Macs, Linux, PCs and Windows, notebooks, and smartphones.

Finally, VDI/ desktop as a service can take advantage of cost-effective and ubiquitous broadband, cost-effective and optimized datacenter hardware, and growing trust in the cloud.

How VDI/Desktop as a Service Helps Your Enterprise Customers

VDI/desktop as a service can help CIOs to:

- Increase user productivity, including that of employees, branch offices, remote locations, and contractors
- Enhance global competitiveness
- Deliver strategic value through controlling total cost of operations
- Help ensure data protection, compliance, and security
- Handle increasing user demand for video and other interactive rich multimedia applications

VDI/desktop as a service can help CIOs and IT managers to:

- Minimize new deployments and data center sprawl
- Control upfront and lifecycle costs
- Increase service deployment speed and versatility with reduced costs
- Offer near-native experience

VDI/desktop as a service can help end users to:

- Enjoy LAN performance levels despite their geographic locations
- Experience anytime, anywhere, any device, any media connectivity
- Help align existing and virtual desktop experiences

VDI/desktop as a service is not without its challenges. With VDI/desktop as a service, business customers are concerned about whether:

- Service-level agreements are rigorous enough to help ensure service availability and responsiveness, for example
- WAN bandwidth is adequate for remote users to employ VDI/desktop as a service and rapidly access applications in data centers
- Users will adopt the new desktop computing model
- User productivity could be impacted by possible application and network performance issues with VDI/desktop as a service

To host desktops in the cloud, there are certain cloud and data center requirements, such as high memory capacity for servers in data centers, carrier class scale and reliability, security including logical and physical server separation, and global distribution capabilities. In addition, VDI/desktop as a service relies on a high level of automation for economies of scale in delivering services. To enable full utilization of IT assets, multitenancy capabilities also are essential.

For service providers, concerns about implementing VDI and offering desktop as a service include:

- How to create the business case for VDI/desktop as a service
- How to deploy the solution with less risk
- Application and infrastructure dependencies and effects
- Virtual desktop density, load, and transfer rates
- Greater reliance on networked storage and possibly increased costs
- Session encryption and increased CPU overhead and solution costs
- Network performance and latency issues, especially between the cloud and campuses, for example
- WAN optimization, especially for remote and mobile workers
- High security for data protection in the cloud
- Delivering LAN-like access to interactive rich multimedia for remote workers
- Local volume-printing performance and costs in branch offices
- Increased system availability and business continuance

As the number of users of VDI/desktop as a service increase, so does complexity. Service providers will not only serve task workers who share the same applications but also power users and knowledge workers who require greater mobility and more diverse and complex applications, including interactive rich multimedia applications with high bandwidth requirements.

While VDI/desktop as a service works best with basic business applications, other applications—running video, multimedia, and collaboration—increase the demands on the server because they are computing intensive and can create server scaling issues in the data center. The challenge with the virtual desktop is the myriad local peripherals and the unlimited number and variety of applications that can be installed in a hosted virtual desktop. IT now must work on solving the problems of local peripherals and interactive rich multimedia delivery with current proprietary display protocols used to present applications. In order to deliver the same network services (functions deployed between the client and server), all of the existing services must be recreated for each of the proprietary protocols, including those for content delivery networks (for example, caching, splitting, multicast), call control, bridging, and gateway.

Moving forward, the focus for VDI/desktop as a service is on centralizing the client/server model in the datacenter, while preserving the interactive rich multimedia experience. VDI/desktop as a service centralizes the desktop as well as the browser, which has evolved to be the primary delivery mechanism for most of the interactive rich multimedia delivered to the client. In contrast, application display protocols are challenged to deliver an equivalent experience on an equivalent network. As a result, vendors are working to deliver portions of the browser experience that are not well delivered within a display protocol, such as Windows Media, Flash, and newer formats like Silverlight.

One of the critical elements then is the relationship between the network and VDI/desktop as a service solution: the availability of the VDI service depends on the availability of the network and, with interactive rich multimedia, the intelligence of the network. For synchronization and other connectivity, the entire desktop with all its applications must be streamed across the network, including video streaming at scale.

To provide a VDI/desktop as a service to enterprises, service providers need a formula that focuses on the right approach and the right architecture.

The Right Approach to the Right Architecture

When implementation of a virtual desktop infrastructure fails or stalls, it typically is due to a lack of strategic planning around, for example, the need for expertise and process, understanding user requirements and application usage, and performing a comprehensive cost analysis of existing and targeted infrastructures. In Cisco's own 2009 December survey of service providers about services in the cloud, service providers cited the number 1 concern by project phase as follows: ROI analysis in the strategy phase, design of cloud security architecture in the planning and design stage, and security architecture realization in the implementation phase.

Before implementing VDI/desktop as a service, according to Gartner's 2009 report "Best Use Scenarios for Hosted Virtual Desktops," businesses need:

- Extensive planning, combined with a thorough understanding of users, applications, and manageability requirements
- Sound business justifications (TCO and ROI)
- Well-defined processes and automation
- Piloting of staged implementations

Expertise Helps

Before embarking on VDI/desktop as a service, service providers should consider the staffing and expertise that is required and determine whether that expertise exists within their businesses. For VDI, the experts should offer a wide variety of expertise, not just virtualization expertise. The required expertise might include such areas as business strategy and planning, organizational readiness, service-level agreements (SLAs), service delivery, cost and service modeling, and cloud environments, as well as a systematic approach based on shared best practices and proven methodologies.

For example, you should seek skilled data center architects with appropriate certifications and experience in data centers of your size and in the cloud model, as well as expertise that can augment your own. In addition, expertise should extend across the entire infrastructure, including branch offices, WAN transport design, data center infrastructure, and storage networks.

Customer User Profiles

Proper data sizing for your customer's user types is critical for a successful VDI/desktop as a service deployment, since it affects the end-user experience. To create your customer's user profiles, be sure to factor in:

- Physical desktop usage
- CPU consumption
- Memory consumption
- Storage throughput
- Network throughput
- Concurrent usage of applications

In addition, plan for spikes in usage.

Thinking about Implementing VDI?

Here's a VDI implementation checklist.

- Understand the unique user needs and requirements by role, location, and activities, including application usage and user interactive rich multimedia needs.
- Develop user application and service usage scenarios.
- Select the VDI model: on premise and/or in the cloud.
- Evaluate your existing infrastructure for operational readiness; use your investment in virtualization.
- Examine the VDI expertise required and whether it exists in house.
- Add expertise that augments your own and provides shared knowledge and processes. Select best-in-class partners.
- Develop a strategy, build the business case, including all existing desktop costs, and calculate VDI ROI.
- Take a comprehensive, end-to-end approach to networks, servers, applications, storage, security, policies, and processes.
- Address desktop management issues in the data center created by VDI.
- Plan, test pilots, design, stage and validate, then implement your solution.

A cohesive process managed by subject-matter experts in strategy, planning, design, and implementation can result in less business risk and faster time to value. From evaluating desktop opportunities and assessing applications to use within VDI/desktop as a service to creating a phased road¬map for implementing and supporting your service offerings in the cloud, these experts should take a comprehensive approach across applications, desktops, servers, storage and data networks, and business policies and procedures.

A VDI/desktop as a service expert can address data protection and compliance within VDI with desktop and application centralization and segregation of users. In the area of business continuity, they can help create simple and fast disaster recovery plans. With a VDI management dashboard, you can make sure that you are delivering an optimal experience to all customers, including enterprises, small and medium businesses, power users, knowledge workers, and task workers.

Know Your Customer's Users

Service providers considering VDI/desktop as a service as an offering first must understand how their customer's users are using or will use desktop applications securely over the network—no matter who the users are (employees, contractors, guests, task workers, knowledge workers, or power users), where they are (branch offices, campuses, remote or mobile), or what they do (engineers, sales people, managers, and call support).

Understanding customer user requirements and creating highly granular, segmented customer user profiles can drive a strategic use of desktop virtualization as a service, allowing customers to experience flexible service delivery with new services and productivity gains.

Build the Business Case and Strategy

The steps to VDI/ desktop as a service success start with strategy development around people, processes, and technologies. There are three recommended steps to this approach.

1. Understand your customer's current business and technical challenges to build a business case for VDI/desktop as a service.
2. Assess your customer's current infrastructure and end-state objectives to develop one or more solution scenarios for VDI/desktop as a service.
3. Apply the data center operations management and cloud model to existing processes and service models to develop an operational readiness roadmap.

Typical use cases or solution scenarios for VDI/desktop as a service might involve:

- Software developers, who can benefit from improved data security and hosted, highly scalable test and development environments
- Remote workers, who need more support
- Temporary workers, who require provisioning and de-provisioning quickly
- Trading rooms and traders, who require rapid event and disaster recovery
- Call centers, where desktops are shared and require rapid user customization

In addition to customer's user and use case requirements for VDI/desktop as a service, services providers should evaluate:

- Platform requirements, including server, client, and mobile
- Management requirements, including provisioning, deployment, and connection brokers
- The customer's user experience, involving displays, multimedia needs, and other peripherals

Your analysis should include how your network infrastructure, computing and storage infrastructures, and WAN transport can be reconfigured to help increase the return on your virtualization and cloud investments.

In addition to developing the VDI/desktop as a service strategy and business case with ROI, this approach can help service providers:

- Quantify cost savings with measurable benefits for their own operational efficiencies
- Improve their own operations management
- Increase their own success factors and reduce operational risk

Offer Tight Service-Level Agreements

For hosted models in the cloud, service providers should clearly define SLAs that encompass business continuity and disaster recovery timeframes, availability, performance, costs, and chargebacks. In addition, because a VDI/desktop as a service solution touches everything in the service provider data center, SLAs must map to other SLAs for storage, for example.

Take Advantage of Strong Security

Security, of course, tops everyone's concerns, and the good news is that VDI/desktop as a service can provide very good security because all data and images are stored in the data center. VDI/ desktop as a service also can provide control and visibility from the data center; for example, VDI/ desktop as a service can incorporate functionally for controlling access to endpoint devices with strong authentication, encryption, VPN tunneling, and firewalls much more easily than with traditional PCs.

Design and Plan, Stage and Validate, Then Implement

In the design and planning stages for VDI/desktop as a service, you need to develop design documents and specifications for your cloud and your VDI/desktop as a service solution, as well as an operational readiness implementation plan for implementing your service offering. Your efforts in defining customer user needs and requirements as well as use cases can result in updated or new service models to support the rollout and sustainability of VDI/desktop as a service as a service offering.

Once you have a high-level design for your desktop virtualization solution, you can test your desktop virtualization pilot in a well-designed, controlled lab. With a low-level customized virtualization infrastructure design and a plan for your physical-to-virtual migration process, you then can stage, validate, and finally update your VDI/desktop as a service solution. Your solution then moves into production. The environment is documented, and full production readiness determined.

As a result of your comprehensive planning, design, and implementation efforts, desktops and data are secure in the data center, while desktops can be managed in the cloud, at reduced cost. With VDI/desktop as a service, customer freedom expands. Desktops are tied to customer user identity, not the device. Applications are available 24 hours a day, seven days a week, and the desktop experience is richer.

What can you expect from the newly implemented VDI/desktop as a service?

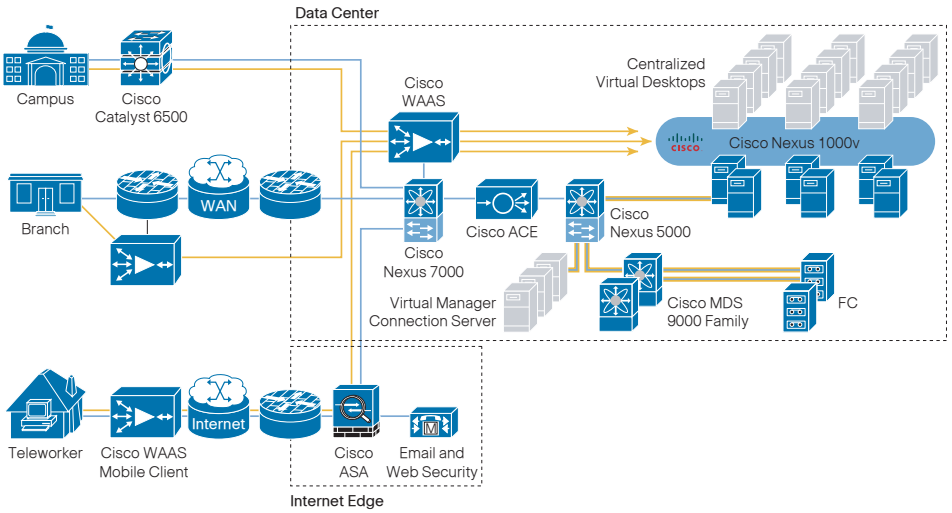
A VDI/desktop as a service can easily integrate into existing environments and can coexist well with existing desktops, requiring no changes to current applications. VDI runs most off-the-shelf, legacy, or custom applications without any modifications.

Customers can access their familiar personalized desktops and run the same applications they would run on their traditional desktops—without any new training. Customers can experience improved service levels with optimized applications and data always available. VDI/desktop as a service performance is currently very effective for applications that do not involve power users or interactive rich multimedia applications.

With VDI/desktop as a service, businesses can rely on services providers to provide more flexible access to applications, since data and access to end point devices is secure while delivering near-LAN performance for most applications. This centralized desktop environment also results in greater streamlined application management.

In fact, VDI may be the first step for service providers in delivering to customers a virtualized desktop and application experience with all kinds of interactive rich multimedia and user devices: business and personal PCs, desktop phones, cell phones, tablets and iPads, and other smart devices, thus creating a new desktop paradigm around customer productivity, mobility, collaboration, and empowerment. An end-to-end, hosted virtual desktop solution could provide customers with virtualization-aware computing, networking, and network services technologies that optimize traffic flows and improve performance of interactive rich multimedia applications in a virtualized environment. This systems approach with its end-to-end deployment, security and security policies, increased scalability, application performance acceleration, and personalized user experience (anywhere, anytime, any device, any media) then should be coupled with new business computing models like cloud computing.

Figure 4. VDI/Desktop as a Service in the Cloud



Since each virtual desktop can become an endpoint in the enterprise cloud, VDI/desktop as a service also can help lead the way for cloud computing. By moving desktops into the cloud architecture, service providers can deploy and provision new applications rapidly and extend application services to external parties in the cloud, while controlling secure access to sensitive resources.

Conclusion

VDI can play an important role as part of an overall strategy to make more resources and services available anytime and anywhere to authenticated and validated customers. It provides the flexibility to quickly deliver, refresh, and manage desktops; reduces business risk associated with potential data loss or theft; and lowers the cost of desktop management by reducing complexity and simplifying management. VDI/desktop as a service delivers new efficiencies and improves the customer experience with less downtime and fast, automated service delivery, while supporting the changing needs of global customers, including enterprises, small and medium businesses, remote workers, and new types of independent workers and consultants.

Concerns with VDI/desktop as a service around integrating more complex and interactive rich multimedia applications, bandwidth constraints, governance, and security can be addressed with an end-to-end, architectural and services approach that covers networks, servers, storage, applications, processes, and policies. Building on a unified network and a well consolidated, virtualized, and connected infrastructure with experts experienced in both clouds and data centers of your size and complexity will enable not only desktop virtualization but lay the foundation for emerging solutions within clouds that can continue to improve business productivity, flexibility, and agility in the years ahead, as well generate new forms of revenue and higher service margins.

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